

**WHAT IS CLAIMED IS:**

1. An optical power equalizer, comprising:

a wavelength coupler for separating an optical signal traveling upstream from a single optical fiber;

5 an optical splitter for allowing a part of the upstream optical signal to be transferred to an optical detector for detecting the upstream optical signal's intensity, the optical detector outputting an electrical signal having a signal amplitude proportional to the upstream optical signal's intensity;

10 an active gain control circuit for controlling a driving current to be provided to an optical amplifier, according to the electrical signal; and

a delay element for delaying the upstream optical signal by a time required for the optical detector and the active gain control circuit to perform their operation,

wherein the optical amplifier amplifies the upstream optical signal with an amplification gain according to the driving current from the active gain control circuit.

15 2. The optical power equalizer as set forth in claim 1, wherein the delay element includes a fiber loop.

3. The optical power equalizer as set forth in claim 1, wherein the optical amplifier is a semiconductor optical amplifier.

4. The optical power equalizer as set forth in claim 3, wherein the semiconductor optical amplifier has a switching time having an order of magnitude of nanoseconds.

5. The optical power equalizer as set forth in claim 1, wherein the active gain control circuit outputs a driving current having an amplitude inversely proportional to the intensity of the upstream optical signal.

5           6. A method for optical power equalization for optical signals traveling upstream in a passive optical network, the method comprising the step of:

separating an optical signal traveling upstream from a single optical fiber;

detecting the upstream optical signal's intensity;

providing an indication of the upstream optical signal's intensity;

10           delaying the upstream optical signal, and

amplifying the upstream optical signal in accordance with the indication to keep the optical intensities of upstream signals incoming from a plurality of Optical Network Units uniform.

7. The method as set forth in claim 6, wherein said delaying step delays the upstream optical signal a time having an order of magnitude of nanoseconds.

15